

# Vancouver HOV Lane Pilot Project

## **Evaluation Report #3**

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July 2002

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#### Glossary

**Auto Occupancy.** The number of persons per non-transit vehicle.

**Vehicle Occupancy.** The number of persons per vehicle, including transit vehicles.

**GP Lane:** General Purpose Lane. A travel lane that is open to all vehicles.

**HOV Lane:** High Occupancy Vehicle Lane. A travel lane limited to vehicles carrying more than one person. The I-5 HOV lanes require a minimum of two persons per vehicle. Some HOV lanes require a minimum of three persons per vehicle.

**Peak Hour.** For this report, the peak hour is defined as the one-hour increment carrying the greatest number of vehicles. The peak hour could also be defined as the one-hour increment carrying the greatest number of persons. The peak hour was 6:15-7:15 AM for the Baseline, November 2001, and March 2002 reporting periods. The peak hour shifted to 6:00-7:00 AM during the July reporting period.

**Peak Period/Two-Hour Period.** For this report, the peak period or two-hour period is defined as the two-hour increment during which the HOV lane is operational (6:00 - 8:00 a.m.). The peak period is the period of time (1-3 hours typically) with the greatest number of vehicles or the greatest number of persons.

**Variable Message Sign (VMS).** An electronic sign displaying current travel information. A VMS can display construction status, general traveler information, delays, and safety information.

July 2002 Glossary

## VANCOUVER HOV PILOT PROJECT EVALUATION REPORT #3 KEY FINDINGS AND CONCLUSIONS TO DATE

- Of the eight HOV goals, the Vancouver HOV pilot project is meeting six goals and partially meeting one goal. The pilot project is meeting Goals 2, 3, 4, 5, 6, and 7. The pilot project is partially meeting goal 8. Goal 1 is not being met.
- 1. Move more people per lane in the HOV lane during the AM 2-hour period than in either of the adjacent general-purpose lanes.
  - ➤ The Vancouver HOV lane is not currently carrying more people per lane than either of the adjacent lanes.
- 2. Reduce peak period travel time for HOV lane users and reduce the average per-person travel time for all users.
  - Peak period and peak hour travel times for HOV lane users have been reduced since the Baseline reporting period. Average per-person travel times for all users have been reduced during the peak period and peak hour travel periods compared to the Baseline reporting period. There have been minor fluctuations in per-person travel times during the November, March, and July reporting periods.
- 3. Minimize impacts to other traffic in the corridor and on parallel facilities.
  - ➤ Compared to the Baseline, the share of traffic on I-205 increased slightly while the share of traffic on Highway 99, Hazel Dell Avenue, and Lakeshore Drive decreased. The share of traffic on Main Street increased in July compared to the Baseline, but much of the increase is likely attributable to the completion of construction at the Main Street interchange.
- 4. Increase the use of carpools, vanpools, and transit.
  - The number of carpools and transit ridership have increased since the Baseline reporting period. Transit ridership increased initially and remained stable from November to July, possibly reflecting that C-TRAN's I-5 Park-and-Ride lots and commuter buses are at capacity.
- 5. Maintain safety by not increasing the accident and incident rate in the corridor during HOV lane operating periods.
  - The number of on-roadway incidents has decreased since the HOV became operational.
  - The number of off-roadway incidents increased compared to the prior reporting periods. WSDOT recently expanded its Incident Response Program. The increase in off-roadway incidents might reflect a greater percentage of the actual number of incidents being reported rather than an actual increase in the number of incidents.
- 6. Maintain the HOV lane's effectiveness with appropriate enforcement.
  - ➤ The 2-hour period violation rate was 5 percent during the November 2001 and March 2002 reporting periods. The violation rate increased 1 percent during the July 2002 reporting period.

- ➤ The peak hour violation rate decreased from 5 percent in November 2001 to 4 percent in March 2002. From March to July, the peak hour violation rate increased to 8 percent.
- ➤ The national violation rate average is in the 10-15% range. The Portland HOV lane has a violation rate of 10%, which is also within the national guidelines. The Vancouver lane has a violation rate of 6-8%, which is well within acceptable guidelines.
- The number of enforcement hours decreased from the March reporting period. The increase in the observed violation rate might be partially attributable to the reduction in enforcement hours.
- 7. Maintain or improve travel time reliability for carpools, vanpools, and transit.
  - ➤ Travel time savings during the Two-Hour Period for C-TRAN Route 134 have increased since the Baseline, November, and March reporting periods.
  - Travel time savings during the Peak Hour for C-TRAN Route 134 have increased compared to the Baseline reporting period and have remained constant since the March reporting period.
  - The Vancouver HOV lane is maintaining at least 45 mph along its entire length both during peak hours and overall during the two-hour period.
- 8. Maintain or improve public opinion as to the effectiveness of HOV lanes.
  - Public opinion is being assessed as part of the evaluation process. During the March 2002 survey, 49% of the respondents surveyed support permanent lane adoption and 49% oppose the idea. The percentage of respondents in support of the Vancouver lane adoption differs by only 1% compared to the Baseline study results of 48%.
  - ➤ During the March 2002 public opinion survey, 47% of the respondents surveyed agree that the Vancouver HOV lane is an excellent or good idea as compared to 58% of respondents completing the Baseline study in September 2001. The number of respondents asserting that the HOV lane is a poor idea increased from 27% in the baseline to 41% in the March survey.

# Vancouver HOV Pilot Project Evaluation Report #3

#### **Purpose**

This report is the third in a series of evaluation reports that monitor the effectiveness of the Southbound I-5 High Occupancy Vehicle (HOV) Lane Pilot Project that opened to traffic on October 29, 2001. Data was collected by various agencies both before and after the Vancouver HOV lane was implemented. Information contained in this report will compare the July 2002 information to the baseline information (September 2001) contained in the Baseline Report completed by WSDOT and the consultant team. The report also compares the July 2002 post opening data against the November 2001 and March 2002 post opening information. When opened in November, the Vancouver HOV lane hours of operation were 6 to 9 AM. Evaluation Report #1 found Vancouver HOV lane usage to be most heavily concentrated in the first two hours of operation with a drop in usage during the third hour. Based on the usage data, the Vancouver HOV lane hours of operation were reduced by one hour to 6 to 8 AM. The new hours of operation took effect January 14, 2002. The Baseline Report and Evaluation Report #1 were prepared assessing the 6 to 9 AM period. To ensure consistent comparison across reporting periods, the data from those reports was updated to reflect the new 6 to 8 AM operating period.

This report summarizes data collected during the month of July. It should be noted that the summer time period may have reduced the AM peak person and vehicle trip demand in the corridor. Summer traffic volumes are typically lower than normal due to many factors, including commuters being on vacation and children being out of school. The results included in Report #3 likely represent lower than normal corridor travel demand. The final report will include data collected in late September and early October. The data collected during those periods should be more reflective of typical travel patterns in the I-5 corridor.

Figure 1 shows the Vancouver HOV lane corridor as well as traffic count and monitoring locations.

<sup>&</sup>lt;sup>1</sup> Baseline report data were collected in May and September 2001. Evaluation Report #1 data were collected in November 2001. Evaluation Report #2 data were collected in March 2002. Evaluation Report #3 data were collected in July 2002.

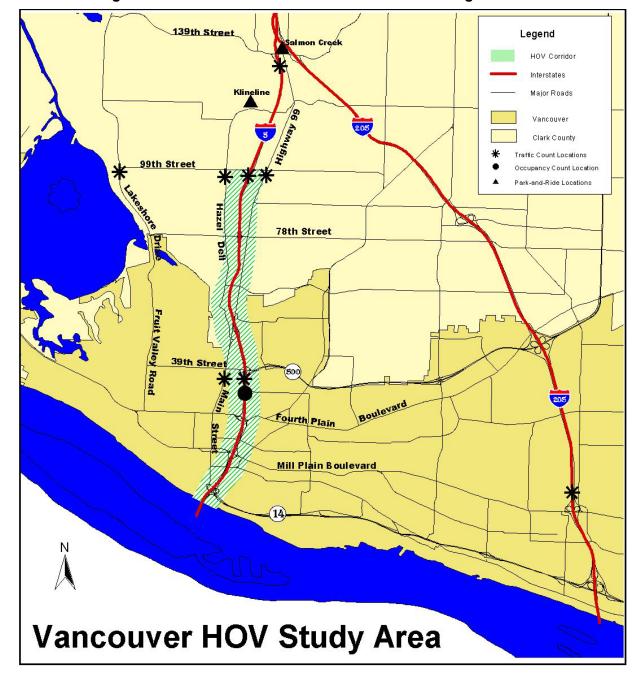


Figure 1. Vancouver HOV Lane and Count/Monitoring Locations

#### **VANCOUVER HOV LANE GOALS**

The goals of the Vancouver HOV Lane Pilot Project are:

- 1. Move more people per lane in the Vancouver HOV lane during the AM 2-hour period than in either of the adjacent general-purpose lanes.
- 2. Reduce peak period travel time for HOV lane users and reduce the average per-person travel time for all users.
- 3. Minimize impacts to other traffic in the corridor and on parallel facilities.
- 4. Increase the use of carpools, vanpools, and transit.
- **5. Maintain safety** by not increasing the accident and incident rate in the corridor during HOV lane operating periods.
- 6. Maintain the HOV lane's effectiveness with appropriate enforcement.
- 7. Maintain or improve travel time reliability for carpools, vanpools, and transit.
- 8. Maintain or improve public opinion as to the effectiveness of HOV lanes.

#### **EVALUATION (PERFORMANCE) MEASURES**

An Interagency Team, comprised of representatives from the Washington State Department of Transportation (WSDOT), C-TRAN, the City of Vancouver, Southwest Washington Regional Transportation Council (RTC), Oregon Department of Transportation (ODOT), and Metro, established the following performance measures to be used to evaluate the Vancouver HOV Lane Pilot Project:

**Operations** – total persons using the corridor, travel times (HOVs, Single Occupant Vehicles [SOVs], and freight), safety, enforcement, traffic impacts to parallel routes, and traffic operations at the beginning and ending transitions.

**Modal Impact** – HOV lane utilization, transit ridership, increase in transit service, number of persons per vehicle, Park-and-Ride use, vanpool use, and employer programs.

**Public Opinion** – Public perceptions of success. This will include survey results, phone calls, internet comments, etc.

This report is the second post-HOV opening evaluation report and describes the baseline and post-HOV lane opening conditions for each of the Vancouver HOV lane goals.

#### **DATA COLLECTION METHODOLOGY**

Before and after traffic count data were collected from WSDOT, City of Vancouver, RTC, and Clark County. Bus passenger counts were collected by C-TRAN. The consultant team performed travel time runs as well as vehicle occupancy counts using standard and nationally accepted data collection techniques. A WSDOT incident response vehicle patrols the I-5 corridor during the AM peak period. The vehicle has been collecting corridor travel time data on a daily basis since December 2001.

Vehicle occupancy counts consisted of counting every vehicle in a single lane for 15-minute intervals and noting the number of occupants in each vehicle. The occupancy counts rotated

across all lanes. Bus ridership was determined using C-TRAN counts provided for those routes using the I-5 corridor on the same dates that vehicle occupancy counts were taken. Percentages of the number of vehicles and persons for each travel mode were then applied to traffic counts, taken for each lane, by WSDOT's automated traffic recorders that provide continuous traffic counting. Appendix B contains a description of the data collection process for travel time runs.

#### **HOV LANE GOALS**

## Goal 1. Move more people per lane in the Vancouver HOV lane during the AM 2-hour period than in either of the adjacent general-purpose lanes.

This measure is the total number of persons traveling the corridor during the AM peak hour or period. **Figures 2** and **3** show the total number of person trips (sum of persons per lane) based on counts taken in May 2001 (vehicle occupancies) and September 2001 (counts) for the Baseline Report. Post opening vehicle occupancy and vehicle counts are listed for November 2001, March 2002, and July 2002. A table summarizing person and vehicle trips for all reporting periods is included in Appendix A. **Table 1** shows the number of persons per lane, measured near 33<sup>rd</sup> Street, for the three through traffic lanes in that section.

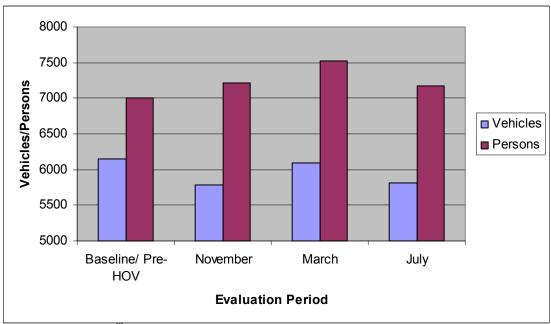


Figure 2. Total Person & Vehicle Trips: 6-8 AM

Measured near 33<sup>rd</sup> Street for the three through traffic lanes.

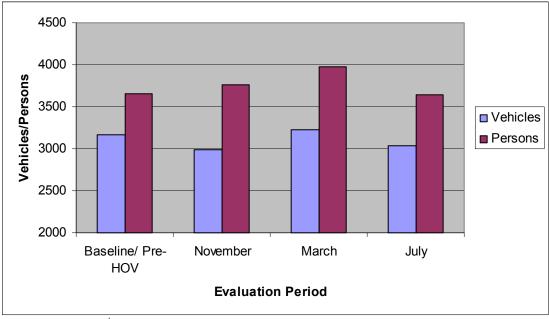


Figure 3. Person & Vehicle Trips: Peak Hour

Measured near 33<sup>rd</sup> Street for the three through traffic lanes

**Table 1. Persons Per Lane** 

	Baseline (September 2001)	After HOV Opening (November 2001)			V Opening h 2002)	After HOV (July	Opening 2002)
Measure	All Lanes	HOV Lane	Each GP Lane	HOV Lane	Each GP Lane	HOV Lane	Each GP Lane
Two-hour count (6-8 AM)	2,337	1,885	2,668	1,888	2,817	1,854	2,662
Peak hour count (6:15- 7:15 AM)	1,220	1,016	1,376	1,003	1,489	824	1,407

Measured near 33<sup>rd</sup> Street for the three through traffic lanes. GP Lane = General Purpose Lane

**Figure 4** shows average vehicle occupancy (all persons using the corridor divided by the total number of vehicles). Average vehicle occupancy reflects person trips occurring in all modes of travel on I-5. Detail occupancy data is provided in Appendix A.

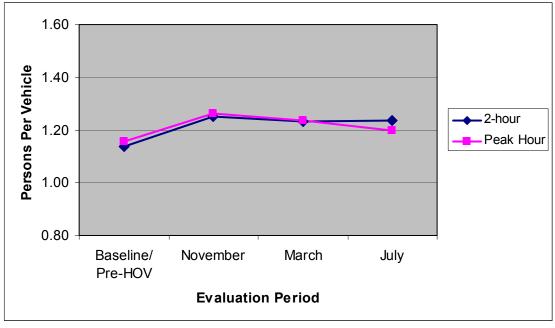


Figure 4. Vehicle Occupancy

Based on measurements taken near 33<sup>rd</sup> Street. Vehicle occupancy is total persons in all vehicles (including transit) divided by the total number of vehicles.

#### **Findings To Date**

- The summer time period may have reduced the AM peak person trip demand in the corridor, due to many travelers being on vacation, and thus affected the results shown here.
- Although the number of two-hour vehicles has decreased, the number of two-hour person trips carried on the I-5 corridor has increased compared to the baseline.
- Bus ridership on I-5 routes has increased from 499 two-hour-period riders before the Vancouver HOV lane opened to 579 two-hour period riders after the Vancouver HOV lane opened in July. This ridership level is steady since November 2001, possibly reflecting that C-TRAN's I-5 Park-and-Ride lots and commuter buses are at capacity.
- The number of peak hour persons using the I-5 corridor has decreased compared to the prior to HOV opening and the first two "after opening" reports.
- During the November 2001, March 2002, and July 2002 evaluation periods, the Vancouver HOV lane was not carrying more persons per lane than either of the adjacent general purpose lanes.
- There was an increase in the average vehicle occupancies on I-5 compared to the Baseline (prior to HOV opening).
- During the peak hour, average vehicle occupancy declined from March to July. During the 2-hour period, average vehicle occupancies increased slightly from March to July.

The table and figures above are summaries of vehicle occupancy counts, traffic counts, and bus ridership counts taken before and after the Vancouver HOV lane opened. The tables in Appendix A give baseline and "post-opening" total number of persons carried in the corridor and mode shares as well as comparing the average auto and vehicle occupancies to the baseline data. The tables in the Appendix provide more detailed summaries of the vehicle occupancies, mode shares, and vehicle and person trip usage in the I-5 corridor.

## Goal 2. Reduce peak period travel time for HOV lane users and reduce the average per-person travel time for all users.

Travel time will be measured by taking travel time runs in the field and making comparisons between the HOV and GP lanes.

Travel times are summarized for single-occupancy vehicles and high occupancy vehicles in **Figures 5** and **6**. Expanded versions of Figures 5 and 6 containing data for all reporting periods are included in Appendix A. Since there was no HOV lane in the baseline condition, it is assumed that all of the vehicles on southbound I-5 had the same travel time.

It should be noted that the peak hour travel times are lower than the two-hour travel times. The higher volumes of traffic during the peak hour likely cause queuing near the Interstate Bridge. Vehicles traveling the corridor after the close of the peak hour are then subjected to slower travel times through the southern sections of the corridor, thus causing slower travel times for the two-hour period.

Travel time by segment has been averaged over multiple observations made in each reporting period during the 6 to 8 AM period using the moving vehicle method described in the appendix of this report. The travel times were categorized for vehicles traveling on the corridor between the 99<sup>th</sup> Street interchange and the Interstate Bridge. Travel times were measured between off ramps. WSDOT provides an incident response vehicle that drives the general purpose lanes and monitors the I-5 corridor during peak periods to respond to incidents or motorists' maintenance needs on the corridor. WSDOT has been collecting travel times on a daily basis since mid-December. The information from these travel runs was combined with the data collected by the consultant team. Combining these data sets provides an accurate picture of what is happening in the corridor on a daily basis. Note that HOV lane travel time computations are based on a limited number of observations and are subject to considerable variation. The listed travel times are approximate values, not absolute numbers.

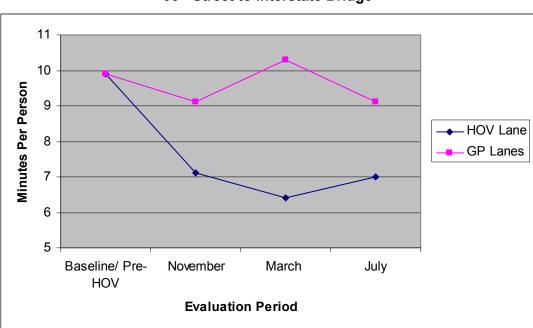


Figure 5. Two-Hour Travel Time Results for HOV and General Purpose Users 99<sup>th</sup> Street to Interstate Bridge

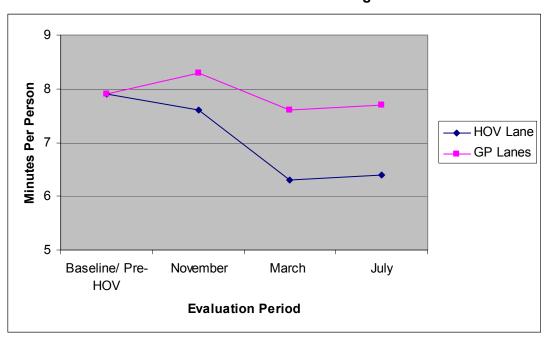


Figure 6. Peak Hour Travel Time Results for HOV and General Purpose Users

99<sup>th</sup> Street to Interstate Bridge

#### **Findings To Date**

- On the measured days in July, the Vancouver HOV lane saved users an average of two minutes per HOV vehicle over the entire two-hour period compared to GP users.
- Between March and July, peak hour travel times increased for both GP and HOV users even though HOV and GP lane volumes decreased over the two-hour period. This may be due to a higher number of out-of-area users (summer travelers) in the corridor in July compared to other periods. The out-of-area users may not be familiar with the HOV operations.
- Travel time savings during the peak hour for users of the Vancouver HOV lane have remained constant since the March reporting period. Travel time savings measured in March and July averaged slightly more than one minute per HOV vehicle compared to GP users.

A more detailed travel time summary is included in Appendix A.

**Figure 16** details C-TRAN bus travel times in the corridor.

The second half of Goal 2 is to reduce the average per person travel time for all users. Per person travel time is measured by summing the travel times for all persons in the HOV lane and the general purpose lanes and dividing the total travel time by the total number of persons. **Figure 7** summarizes travel time per person for both the 2-hour period and the peak hour. Since there was no HOV lane in the baseline condition, it is assumed that all of the vehicles on southbound I-5 had the same travel time. Page 5 contains a general summary of the

methodology used to calculate average travel times. A detailed methodology summary is contained in Appendix B.

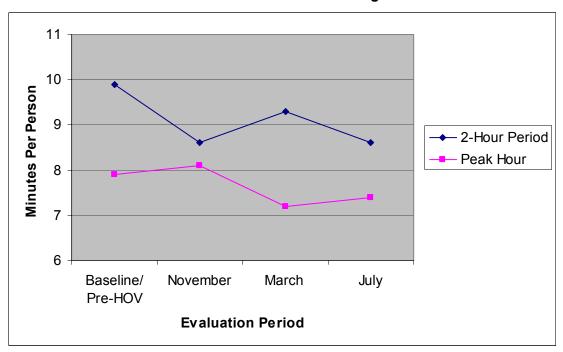


Figure 7. Travel Time Per Person, All Lanes 99<sup>th</sup> Street to Interstate Bridge

#### **Findings To Date**

- During the 2-hour period, travel time per person decreased compared to the Baseline and March reporting periods. Travel time per person in July was equal to the November reporting period.
- During the peak hour, travel time per person decreased compared to the Baseline and November reporting periods. Peak hour GP and HOV travel times increased slightly from March to July even though total volumes and total persons decreased.

#### **WSDOT Incident Response Vehicle Travel Times**

WSDOT provides an incident response vehicle that drives and monitors the I-5 corridor during peak periods to respond to incidents or motorists' maintenance needs on the corridor. WSDOT has been collecting travel times from those vehicle runs. The travel times are from the 99<sup>th</sup> Street Interchange to the Interstate Bridge. These runs are summarized in **Figure 8**. The figure summarizes incident vehicle trip times between 6:00 a.m. and 8:00 a.m. during which the WSDOT vehicle did not stop to assist a motorist. The chart summarizes trips from the March and July reporting periods. For trips in excess of 20 minutes, the figure denotes whether the delay was related to an incident. The average travel time for the 333 trips was 9.8 minutes. If the 9 incident trips over 20 minutes are removed, the average travel time for the remaining 324 trips was 9.1 minutes.

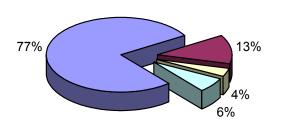
The data collected during WSDOT's travel time runs has been utilized on a daily basis to provide "real time" information to the traveling public. The travel time information is posted on WSDOT's Variable Message Sign (VMS) southbound on I-5 near the Clark County Fairgrounds.

Figure 8. I-5 General Purpose Lane Travel Times 99<sup>th</sup> Street to Interstate Bridge

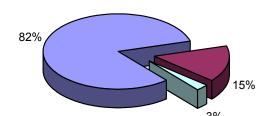
■ 11-20 minutes

☐ 21+ minutes (Incident related) ☐ 21+ minutes (No incident identified)

December 17, 2001 - March 22, 2002 191 Trips







March 25, 2002 - July 17, 2002

#### Goal 3. Minimize impacts to other traffic in the corridor and on parallel facilities.

With increased delay in the general-purpose lanes, there is a potential that traffic could divert to parallel routes, such as I-205, Highway 99, Hazel Dell Avenue, and Lakeshore Drive. These counts were taken south of 99<sup>th</sup> Street. Additionally, before and after counts were taken for Main Street south of 39<sup>th</sup> Street to determine if traffic was diverting onto that facility to access the downtown area or west Vancouver.

The share of traffic on each facility at the screenline at 99<sup>th</sup> Street is summarized in **Figure 9**. **Figure 10** summarizes the share of traffic on I-5 and Main Street. It should be noted that the I-5 Main Street exit was closed during the Baseline data collection. The exit opened between the Baseline and November reporting periods. The increase in traffic on Main Street is likely attributable to the opening of the Main Street exit. Once opened, people working in downtown and western Vancouver could use the exit to access their work locations.

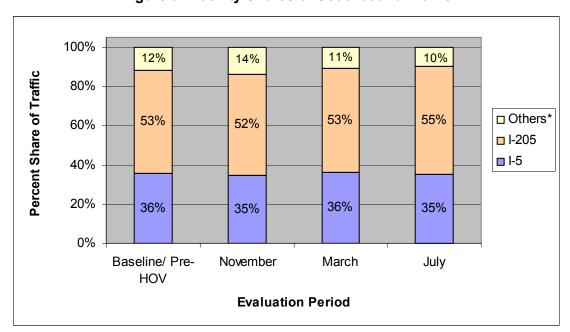


Figure 9. Facility Shares of Southbound Traffic

#### **Findings To Date**

• The Vancouver HOV Lane has not caused a significant shift to I-205 or to parallel arterial routes.

<sup>\*</sup>Other facilities include Lakeshore Drive, Highway 99, and Hazel Dell Avenue.

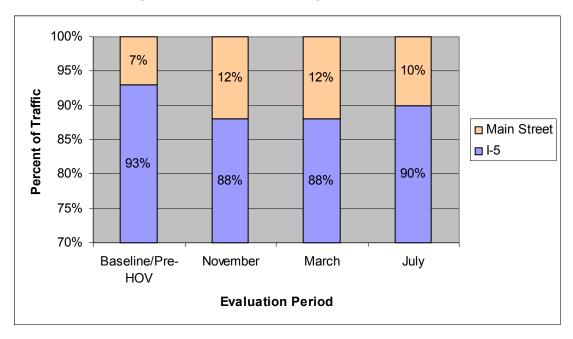


Figure 10. Traffic Percentages Near 33<sup>rd</sup> Street

#### **Findings To Date**

 The share of traffic on I-5 has increased since the prior reporting period, but has remained relatively stable during the November, March, and July reporting periods. Fluctuations appear to be related to construction activity at the I-5/Main Street interchange, and paving work on Fourth Plain Boulevard.

#### **Other Traffic Impacts**

During the 5-9 a.m. period, I-5 is carrying more vehicles compared to the Baseline and November reporting periods. I-5 traffic count data from the 5-6 a.m. and 8-9 a.m. period were analyzed to determine if traffic volumes were shifting to the hour before or after HOV lane operating hours. There is no evidence to conclude that the HOV lane is causing a shift of traffic to the 5-6 a.m. period or the 8-9 a.m. period. See Appendix A for detailed I-5 traffic counts.

#### Goal 4. Increase the use of carpools, vanpools, and transit.

This goal will be measured by vehicle counts and data from C-TRAN on ridership and Park-and-Ride utilization.

#### Persons in Carpools, Vanpools, and Transit

**Figure 11** shows the persons in carpools, vanpools, and transit before and after HOV opening. The after HOV opening persons are reported for I-5 users regardless of which lane they are using. A more detailed data table is included in Appendix A.

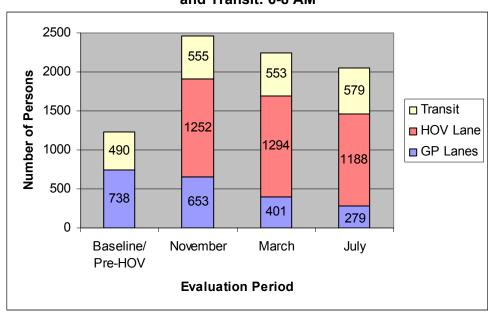


Figure 11. Persons in Carpools, Vanpools, and Transit: 6-8 AM

#### **Findings To Date**

- From March to July, there was a decrease in the number of persons using I-5 in carpools, vanpools, and transit. Excluding eligible HOVs that are using the general purpose lanes, the Vancouver HOV lane has led to an increase of over 500 persons in carpools, vanpools, and transit compared to the baseline.
- Transit usage has remained steady since November 2001, possibly reflecting the I-5 commuter buses operating at capacity.

#### Park-and-Ride Usage

Park-and-Ride usage can be used to measure the performance of the Vancouver HOV lane. Changes in Park-and-Ride usage can be compared to changes in transit ridership to identify any patterns of increased or decreased transit usage. Park-and-Ride usage is summarized in **Table 2**.

Table 2. Park-and-Ride Usage

Location	Baseline Daily Usage (Vehicles)	Daily Usage after HOV Opening (November 2001)	Daily Usage After HOV Opening (March 2002)	Daily Usage After HOV Opening (July 2002)
Salmon Creek Park-and-Ride <sup>1</sup>	439	438	428	436
Klineline Park	15	22	22	NA <sup>2</sup>

May 15-17, 2001 average (baseline).

November 2001, March 2002, and July 2002 (post-opening).

#### **Vanpools and Employer Programs**

C-TRAN offers a vanpool service program. C-TRAN subsidizes 25 percent of the lease cost for vanpools traveling to or from Clark County. C-TRAN also subsidizes the entire cost of fuel for vanpools traveling to or from Clark County and provides car wash coupons free of charge to vanpools participants. Eight (8) commuter vanpools carrying 86 vanpool riders currently operate. All 8 vanpools carry passengers from Washington to Oregon. Those vanpools travel to Farmers Insurance, Tektronics, Fred Meyers, and to various Swan Island businesses.

The total number of vanpools has not changed since the March reporting period. The number of vanpools currently operating is significantly less than past years. In February 2000, 15 vanpools were operating from Clark County to the Portland area. C-TRAN staff believes the decline in vanpools is attributable to the slowing economy and associated job decreases.

#### Findings To Date

- The Salmon Creek Park-and-Ride continues to operate at capacity, limiting growth in transit use of the HOV lane.
- The Klineline Park parking facility is not available as a park-and-ride lot during the summer months. During prior reporting periods, approximately 20 vehicles used the "overflow" park-and-ride facility.
- The number of C-TRAN supported vanpools has not changed since the opening of the HOV lane.

<sup>&</sup>lt;sup>1</sup>The capacity of the Salmon Creek Park-and-Ride lot is 436 vehicles.

<sup>&</sup>lt;sup>2</sup>Klineline Park is not used as a park-and-ride facility during the summer months.

## Goal 5. Maintain safety by not increasing the accident and incident rate in the corridor during HOV lane operating periods.

Safety is measured by examining reported accidents before and after HOV lane opening. There is a time lag between the time of the accident and when the accident is recorded to the state's accident database. Therefore, all reported accidents might not be included in this report.

A secondary measure is also used to evaluate corridor safety, which consists of using Washington State Police (WSP) and WSDOT incident management vehicle callout logs. As needed, the WSP dispatches incident response requests to WSDOT through their traffic management center. WSDOT staff is available to respond to provide assistance to disabled vehicles, crash scenes, and other incidents. The number of callouts is a measure of safety. **Table 3** details the number of Washington State Patrol (WSP) and WSDOT call-outs on the southbound side of I-5 between 134<sup>th</sup> Street and the Interstate Bridge. This correlates the number of callouts for incident management, accident scene traffic control, etc. with the safety information needed to evaluate the project.

On-roadway and off-roadway incidents are detailed in Table 3. Off-roadway incidents include vehicle breakdowns, abandoned vehicles, flat tires, running out of gas, etc. Off-roadway incidents may not affect safety other than motorists slowing to view the incident. As such, these incidents may not be relevant to the impact of the HOV lane on the safety of the corridor and occur regardless of the HOV lane. It should also be noted that WSDOT expanded its Incident Response Program in July. As a result, the number or reported incidences increased significantly because WSDOT had more resources allocated to roving and patrolling the corridor.

A word of caution to the reader: accident statistics tend to lag behind the actual reporting dates and accidents often go unreported. Additionally, accident studies tend to look at multiple year periods of at least three years rather than short-term periods such as this. Caution is expressed about drawing long-term conclusions from short-term data.

On-Roadway Off-Roadway **Evaluation Period** Incidents Incidents Baseline/Pre-HOV 10 3 12 0 November 2001 March 2002 7 7 July 2002 5 17

**Table 3. Incident Management Call-Outs** 

Data Collection Periods:

Baseline/September 2001 data (I-5 SB 6 to 9 AM)

October 29 - November 16, 2001 data (I-5 SB 6 to 9 AM)

March 11 – March 29, 2002 data (I-5 SB 6 to 9 AM)

July 1 – 19, 2002 data (I-5 SB 6 to 9 AM)

#### **Findings To Date**

 Based on available data, operation of the Vancouver HOV lane appears to have had no impact on corridor safety or the number of on-roadway incidents. The number of onroadway incidents decreased compared to the November and March reporting periods.

• The number of off-roadway incidents increased compared to the prior reporting periods. WSDOT recently expanded its Incident Response Program. The increase in off-roadway incidents might reflect a greater percentage of the actual number of incidents being reported rather than an actual increase in the number of incidents.

#### Goal 6. Maintain the HOV lane's effectiveness with appropriate enforcement.

A measure of the HOV's effectiveness is to examine its violation rate. This is measured in two ways: the number of observed violators using the vehicle occupancy counts taken for the Vancouver HOV lane, and results of enforcement activities.

**Figure 12** shows the observed violation rates and the number of enforcement hours per day for the Vancouver HOV lane during the HOV operating periods for the November, March, and July reporting periods. The violation percentage represents those persons who were observed violating the HOV restriction. Note that motorcycles are eligible HOV lane vehicles regardless of the number of occupants. **Figure 13** shows the observed violation rates and the number of enforcement hours per day for the Vancouver HOV lane during the peak hour for the November, March, and July reporting periods.

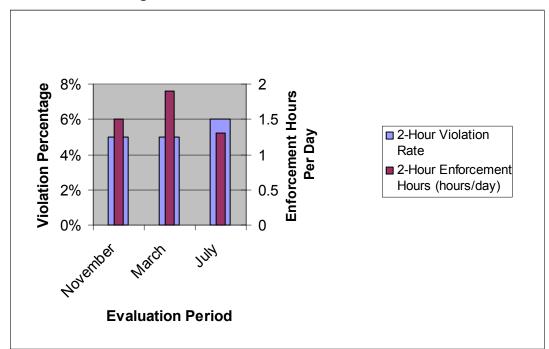
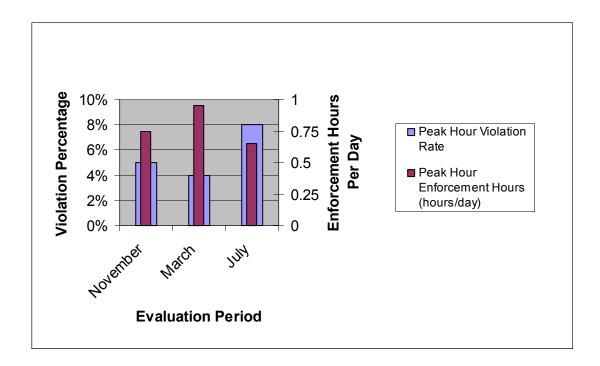


Figure 12. Observed Violation Data: 6-8 AM

Figure 13. Observed Violation Data: Peak Hour



Detailed tables on the observed violation rates and enforcement hours are included in Appendix A.

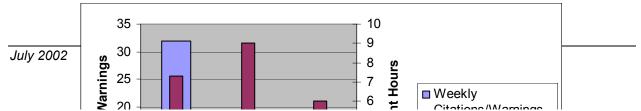
#### **Findings to Date**

- The 2-hour period violation rate was 5 percent during the November 2001 and March 2002 reporting periods. The violation rate increased 1 percent during the July 2002 reporting period.
- The peak hour violation rate decreased from 5 percent in November 2001 to 4 percent in March 2002. From March to July, the peak hour violation rate increased to 8 percent. This seems to correlate the slight reduction in enforcement hours during the July reporting period.
- The national violation rate average is in the 10-15% range. The Portland HOV lane has a violation rate of 10%, which is also within the national guidelines. The Vancouver lane has a violation rate of 6-8%, which is well within acceptable guidelines.
- The number of enforcement hours decreased from the March reporting period. The increase in the observed violation rate might be partially attributable to the reduction in enforcement hours.

#### **Enforcement**

Another measure of the performance of the Vancouver HOV lane is to track the number of HOV citations and warnings issued over time. For baseline conditions, the HOV lane was not operational; therefore, there were no HOV lane violations. The number of HOV lane violations and enforcement hours after HOV lane opening are reported in **Figures 14** and **15**.

Figure 14. Weekly Citations & Enforcement Data



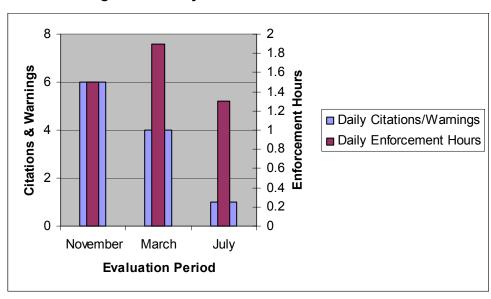


Figure 15. Daily Citations & Enforcement Data

#### **Findings to Date**

 The weekly average number of citations and warnings issued decreased from March to July. While the number of enforcement hours has fluctuated, the number of citations issued has decreased. The enforcement data help confirm the low violation rate in the Vancouver HOV lane.

## Goal 7. Maintain or improve travel time reliability for carpools, vanpools, and transit.

HOV travel time reliability is measured by determining if the Vancouver HOV lane is maintaining an average speed of 45 mph or higher over the length of the lane and evaluating on-time bus performance statistics.

#### **C-TRAN Bus Travel Times**

Bus on-time performance statistics include measuring the travel time from the Salmon Creek Park-and-Ride to the Interstate Bridge. **Figure 16** provides a detailed summary of the travel times for C-TRAN Route 34 from the Salmon Creek Park-and-Ride facility to the Interstate Bridge.

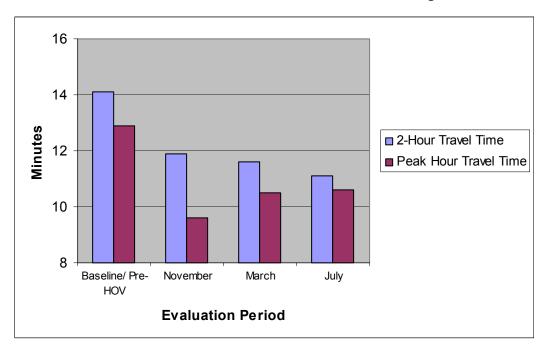


Figure 16. C-TRAN Travel Time Results: Salmon Creek Park and Ride to Interstate Bridge

#### **Findings to Date**

- Travel time savings during the Two-Hour Period for C-TRAN Route 134 have increased since the Baseline, November, and March reporting periods.
- Travel time savings during the Peak Hour for C-TRAN Route 134 have increased compared to the Baseline reporting period.
- Travel times during the Peak Hour for C-TRAN Route 134 remained constant from the March reporting period to the July reporting period.

#### **HOV Lane Average Travel Speeds**

Table 4 details average travel speeds for the HOV lane.

Table 4. HOV Average Travel Speeds Over Two-Hour Period and Peak Hour

Time	November '01 Average Speed (MPH)	March '02 Average Speed (MPH)	July '02 Average Speed (MPH)
Two-hour period 6-8 AM			
99 <sup>th</sup> Street to SR-500	62	62	63
SR-500 to Mill Plain	55	56	57
Average over Length of HOV Lane	60	60	62
Peak hour 6:15-7:15 AM			
99 <sup>th</sup> Street to SR-500	62	63	64
SR-500 to Mill Plain	55	46	59
Average over Length of HOV Lane	60	58	63

Measured from 99<sup>th</sup> Street to Mill Plain Boulevard.

Travel Time Runs from November-December 2001, March 2002, and July 2002.

#### **Findings To Date**

• The Vancouver HOV lane is maintaining at least 45 mph along its entire length both during the peak hour and overall during the two-hour period.

#### Goal 8. Maintain or improve public opinion as to the effectiveness of HOV lanes.

Three public opinion evaluation reports will be generated through the life of the evaluation period. The first survey was conducted prior to the opening of the HOV lane in September 2001. The second public opinion survey was conducted in March 2002. The final survey is scheduled for September 2002. A summary of the September 2001 and March 2002 surveys can be found in Evaluation Reports #1 and #2, respectively.

#### Comments Received from Emails, Letters, and Phone Calls

Agencies within Clark County have received phone calls, letters, and e-mails regarding the Vancouver HOV lane. Most were sent to WSDOT with some directed to RTC and others to C-TRAN. Comments generally were received from those stating they used I-5 as a regular commute, while other comments were received from elected officials and others with interest in the project. Some of the comments were received through the "Hot Issues" section of the web site of the local newspaper, The Columbian.

WSDOT is recording these comments for consideration during the HOV evaluation process.

#### **APPENDIX A**

#### **Goal 1 Tables**

**Table A-1** shows the total number of person trips (sum of persons per lane) based on counts taken in May 2001 (vehicle occupancies) and September 2001 (counts) for the Baseline Report. Post opening vehicle occupancy and vehicle counts are listed for November 2001, March 2002, and July 2002.

Table A-1. Total Person Trips Using the I-5 Corridor<sup>1</sup>

	Base (Septemi			After HOV Opening (November 2001)		After HOV Opening (March 2002)		After HOV Opening (July 2002)	
Measure	Vehicles	Persons	Vehicles	Persons	Vehicles	Persons	Vehicles	Persons	
Two-hour count (6-8 AM)	6,153	7,010	5,779	7,220	6,100	7,521	5,811	7,177	
Change from baseline		-	-374	+210	-53	+511	-342	+167	
Percent change from baseline			-6%	+3%	-1%	+7%	-6%	+2%	
Change from November 2001					+321	+301	+32	-43	
Percent change from November 2001					+6%	+4%	+1%	-1%	
Change from March 2002							-289	-344	
Percent change from March 2002							-5%	-5%	
Peak hour count (6:15-7:15 AM) <sup>2</sup>	3,166	3,660	2,984	3,767	3,223	3,981	3,038	3,638	
Change from baseline			-182	+107	+107	+321	-128	-22	
Percent change from baseline			-6%	+3%	+3%	+9%	-4%	-1%	
Change from November 2001					+239	+214	+54	-129	
Percent change from November 2001					+8%	+6%	+2%	-3%	
Change from March 2002							-185	-343	
Percent change from March 2002							-6%	-9%	

<sup>&</sup>lt;sup>1</sup>Measured near 33<sup>rd</sup> Street for the three through traffic lanes.

<sup>&</sup>lt;sup>2</sup>Peak hour was 6:15-7:15 AM for the Baseline, November 2001, and March 2002 reports. The peak hour shifted to 6:00-7:00 AM during the July 2002 reporting period.

**Tables A-2** through **A-15** give baseline and "post-opening" total number of persons carried in the corridor and mode shares as well as comparing the average auto and vehicle occupancies to the baseline data. These tables provide detailed summaries of the vehicle occupancies, mode shares, and vehicle and person trip usage in the I-5 corridor. The data from these tables were used to develop the tables and graphics for Goal 1 in the main document.

**Tables A-2** and **A-9**, respectively, summarize the baseline two-hour and peak hour person-trip mode shares for all three through traffic lanes while **Tables A-3**, **A-4**, **A-5**, **A-10**, **A-11**, and **A-12** summarize the two-hour and peak hour person-trip mode shares for the November, March, and July post-opening reporting periods. **Tables A-6**, **A-7**, and **A-8** are for the HOV and GP lanes for the two-hour period, while **Tables A-13**, **A-14**, and **A-15** are peak hour tables summarizing the HOV and two through general purpose traffic lanes.

Table A-2. Baseline Two-Hour Persons by Mode for all Lanes on Southbound I-5

Measured	Near	33 <sup>ra</sup>	Street
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Mode	6 to 8 AM Number of Vehicles	Total Persons	Percent of Total Persons
Drive alone	5,288	5,288	76%
Carpool: 2-person	316	632	9%
Carpool: 3+ person	31	93	>1%
Trucks	498	498	7%
Motorcycles	0	0	0%
Buses	20	499	7%
TOTAL	6,153	7,010	100%

<sup>\*</sup>Note: Rounding may result in a sum of the percentages being less than or greater than 100%.

Traffic counts taken in September 2001.

Bus data obtained from C-TRAN.

Average vehicle occupancy
Average vehicle occupancy

total number of persons/total number of vehicles

= 7,010/6,153 = 1.14

Average auto occupancy

= total number of non-transit persons/total number of

non-transit vehicles

Average auto occupancy

= 6,511/6,133 = 1.06

Occupancy counts (each mode's share of total traffic) taken May 16 and 17, 2001.

Table A-3. November 2001 Post Opening Two-Hour Persons by Mode for all Lanes on Southbound I-5

Measured Near 33<sup>rd</sup> Street

Mode	6 to 8 AM Number of Vehicles	Total Persons	Percent of Total Persons
Drive alone	4,570	4,570	63%
Carpool: 2-person	780	1,560	22%
Carpool: 3+ person	23	69	1%
Vanpools	8	88	1%
Trucks	378	378	5%
Motorcycles	0	0	0%
Buses	20	555	8%
TOTAL	5,779	7,220	100%

<sup>\*</sup>Note: Rounding may result in a sum of the percentages being less than or greater than 100%.

Bus data obtained from C-TRAN.

Average vehicle occupancy = total number of persons/total number of vehicles

Average vehicle occupancy = 7,220/5,779 = 1.25

Average auto occupancy = total number of non-transit persons/total number of

non-transit vehicles

Average auto occupancy = 6,665/5,759 = 1.16

Table A-4. March 2002 Post Opening Two-Hour Persons by Mode for all Lanes on Southbound I-5

Measured Near 33rd Street

Mode	6 to 8 AM Number of Vehicles	Total Persons	Percent of Total Persons
Drive alone	4,999	4,999	66%
Carpool: 2-person	790	1,580	21%
Carpool: 3+ person	9	27	<1%
Vanpools	8	88	1%
Trucks	264	264	4%
Motorcycles	10	10	<1%
Buses	20	553	7%
TOTAL	6,100	7,521	100%

<sup>\*</sup>Note: Rounding may result in a sum of the percentages being less than or greater than 100%.

Bus data obtained from C-TRAN.

Average vehicle occupancy = total number of persons/total number of vehicles

Average vehicle occupancy = 7,521/6,100 = 1.23

Average auto occupancy = total number of non-transit persons/total number of

non-transit vehicles

Average auto occupancy = 6,968/6,080 = 1.15

Occupancy counts (each mode's share of total traffic) and traffic counts taken in November 2001.

Occupancy counts (each mode's share of total traffic) and traffic counts taken in March 2002.

Table A-5. July 2002 Post Opening Two-Hour Persons by Mode for all Lanes on Southbound I-5

Measured Near 33<sup>rd</sup> Street

Mode	6 to 8 AM Number of Vehicles	Total Persons	Percent of Total Persons
Drive alone	4,667	4,667	65%
Carpool: 2-person	661	1,322	18%
Carpool: 3+ person	19	57	1%
Vanpools	8	88	1%
Trucks	386	386	5%
Motorcycles	49	49	<1%
Buses	21	608	8%
TOTAL	5,811	7,177	100.00%

<sup>\*</sup>Note: Rounding may result in a sum of the percentages being less than or greater than 100%.

Occupancy counts (each mode's share of total traffic) and traffic counts taken in July 2002.

Bus data obtained from C-TRAN.

One bus was viewed in the GP lanes. Assumed to be tourist bus. Occupancy assumed to be same as that for C-TRAN buses.

Average vehicle occupancy = total number of persons/total number of vehicles

Average vehicle occupancy = 7,177/5,811 = 1.24

Average auto occupancy = total number of non-transit persons/total number of

non-transit vehicles

Average auto occupancy = 5,790/6,569 = 1.13

Table A-6. November 2001 Post Opening Two-Hour Persons by Mode for Southbound I-5: HOV and GP Lanes

Measured Near 33<sup>rd</sup> Street

	HOV Lane			GP Lanes		
Mode	6 to 8 AM Number of Vehicles	Total Persons	Percent of Total Persons	6 to 8 AM Number of Vehicles	Total Persons	Percent of Total Persons
Drive alone	31	31	2%	4,539	4,539	85%
Carpool: 2-person	571	1,142	61%	209	418	8%
Carpool: 3+ person	23	69	4%	0	0	0%
Vanpools	8	88	5%	0	0	0%
Trucks	0	0	0%	378	318	7%
Motorcycles	0	0	0%	0	0	0%
Buses	20	555	30%	0	0	0%
TOTAL	653	1,885	100%	5,126	5,335	100%

<sup>\*</sup>Note: Rounding may result in a sum of the percentages being less than or greater than 100%. Average of occupancy counts taken November 13 and 14, 2001.

Bus data obtained from C-TRAN.

Table A-7. March 2002 Post Opening Two-Hour Persons by Mode for Southbound I-5: HOV and GP Lanes

Measured Near 33<sup>rd</sup> Street

		HOV Lane		GP Lanes		
Mode	6 to 8 AM Number of Vehicles	Total Persons	Percent of Total Persons	6 to 8 AM Number of Vehicles	Total Persons	Percent of Total Persons
Drive alone	31	31	2%	4,968	4,968	88%
Carpool: 2-person	612	1,224	65%	178	356	6%
Carpool: 3+ person	5	15	1%	4	12	<1%
Vanpools	5	55	3%	3	33	1%
Trucks	0	0	0%	264	264	5%
Motorcycles	10	10	<1%	0	0	0%
Buses	20	553	29%	0	0	0%
TOTAL	683	1,888	100%	5,417	5,633	100%

<sup>\*</sup>Note: Rounding may result in a sum of the percentages being less than or greater than 100%. Average of occupancy counts taken March 20 and 21, 2002.

Bus data obtained from C-TRAN.

Table A-8. July 2002 Post Opening Two-Hour Persons by Mode for Southbound I-5: HOV and GP Lanes Measured Near 33<sup>rd</sup> Street

	HOV Lane			GP Lanes		
Mode	6 to 8 AM Number of Vehicles	Total Persons	Percent of Total Persons	6 to 8 AM Number of Vehicles	Total Persons	Percent of Total Persons
Drive alone	38	38	2%	4,629	4,629	87%
Carpool: 2-person	529	1058	57%	132	264	5%
Carpool: 3+ person	14	42	2%	5	15	<1%
Vanpools	8	88	5%	0	0	0%
Trucks	0	0	0%	386	386	7%
Motorcycles	49	49	3%	0	0	0%
Buses	20	579	31%	1	29	<1%
TOTAL	658	1854	100%	5,153	5,323	100%

<sup>\*</sup>Note: Rounding may result in a sum of the percentages being less than or greater than 100%.

Average of occupancy counts taken July 9 and 11, 2002.

Bus data obtained from C-TRAN.

Table A-9. Baseline Peak Hour Persons by Mode for all Southbound I-5 Lanes Measured Near 33rd Street

Mode	6:15 to 7:15 AM Number of Vehicles	Total Persons	Percent of Total Persons
Drive alone	2,708	2,708	74%
Carpool: 2-person	150	300	8%
Carpool: 3+ person	16	48	>1%
Trucks	278	278	8%
Motorcycles	0	0	0%
Buses	14	326	9%
TOTAL	3,166	3,660	100%

<sup>\*</sup>Note: Rounding may result in a sum of the percentages being less than or greater than 100%.

Occupancy counts (each mode's share of total traffic) taken May 16 and 17,

Traffic counts taken in September 2001.

Bus data obtained from C-TRAN.

Average vehicle occupancy

total number of persons/total number of vehicles

Average vehicle occupancy

3,660/3,166 = 1.16

Average auto occupancy

= total number of non-transit persons/total number of

non-transit vehicles = 3.334/3.152 = 1.06

Average auto occupancy

Table A-10. November 2001 Post Opening Peak Hour Persons by Mode for all Southbound I-5 Lanes

Measured Near 33<sup>rd</sup> Street

Mode	6:15 to 7:15 AM Number of Vehicles	Total Persons	Percent of Total Persons
Drive alone	2,356	2,356	63%
Carpool: 2-person	403	806	21%
Carpool: 3+ person	12	36	1%
Vanpools	4	44	1%
Trucks	195	195	5%
Motorcycles	0	0	0%
Buses	14	330	9%
TOTAL	2,984	3,767	100%

<sup>\*</sup>Note: Rounding may result in a sum of the percentages being less than or greater than 100%.

Occupancy counts (each mode's share of total traffic) and traffic counts taken in November 2001.

Bus data obtained from C-TRAN.

Average vehicle occupancy Average vehicle occupancy total number of persons/total number of vehicles

3.767/2.984 = 1.26

Average auto occupancy

= total number of non-transit persons/total number of non-transit vehicles

Average auto occupancy = 3.473/2.970 = 1.16

Table A-11. March 2002 Post Opening Peak Hour Persons by Mode for all Southbound I-5 Lanes Measured Near 33<sup>rd</sup> Street

Mode	6:15 to 7:15 AM Number of Vehicles	Total Persons	Percent of Total Persons
Drive alone	2,647	2,647	66%
Carpool: 2-person	406	812	20%
Carpool: 3+ person	8	24	1%
Vanpools	4	44	1%
Trucks	140	140	4%
Motorcycles	4	4	<1%
Buses	14	310	8%
TOTAL	3,223	3,981	100%

<sup>\*</sup>Note: Rounding may result in a sum of the percentages being less than or greater than 100%.

Occupancy counts (each mode's share of total traffic) and traffic counts taken in March 2002.

Bus data obtained from C-TRAN.

Average vehicle occupancy Average vehicle occupancy

total number of persons/total number of vehicles

3,981/3,223 = 1.24

Average auto occupancy

= total number of non-transit persons/total number of

non-transit vehicles

Average auto occupancy

= 3.671/3,209 = 1.14

Table A-12. July 2002 Post Opening Peak Hour Persons by Mode for all Southbound I-5 Lanes

Measured Near 33<sup>rd</sup> Street

Mode	6:00 to 7:00 AM Number of Vehicles	Total Persons	Percent of Total Persons
Drive alone	2,514	2,514	69%
Carpool: 2-person	288	576	16%
Carpool: 3+ person	8	24	<1%
Vanpools	0	0	0%
Trucks	175	175	5%
Motorcycles	39	39	1%
Buses	14	310	9%
TOTAL	3,028	3,638	100%

<sup>\*</sup>Note: Rounding may result in a sum of the percentages being less than or greater than 100%.

Bus data obtained from C-TRAN.

Average vehicle occupancy = total number of persons/total number of vehicles

Average vehicle occupancy = 3,638/3,038 = 1.20

Average auto occupancy = total number of non-transit persons/total number of

non-transit vehicles

Average auto occupancy = 3,328/3,024 = 1.10

Table A-13. November 2001 Post Opening Peak Hour Persons by Mode for Southbound I-5: HOV and GP Lanes

Measured Near 33<sup>rd</sup> Street

		<b>HOV Lane</b>		GP Lanes			
Mode	6:15 to 7:15 AM Number of Vehicles	Total Persons	Percent of Total Persons	6:15 to 7:15 AM Number of Vehicles	Total Persons	Percent of Total Persons	
Drive alone	16	16	2%	2,340	2,340	85%	
Carpool: 2-person	295	590	58%	108	216	8%	
Carpool: 3+ person	12	36	4%	0	0	0%	
Vanpools	4	44	4%	0	0	0%	
Trucks	0	0	0%	195	195	7%	
Motorcycles	0	0	0%	0	0	0%	
Buses	14	330	32%	0	0	0%	
TOTAL	341	1,016	100%	2,643	2,751	100%	

\*Note: Rounding may result in a sum of the percentages being less than or greater than 100%.

Average of occupancy counts taken November 13 and 14, 2001.

Bus data obtained from C-TRAN.

Occupancy counts (each mode's share of total traffic) and traffic counts taken in July 2002.

Table A-14. March 2002 Post Opening Peak Hour Persons by Mode for Southbound I-5: HOV and GP Lanes

Measured Near 33<sup>rd</sup> Street

		HOV Lane		GP Lanes		
Mode	6:15 to 7:15 AM Number of Vehicles	Total Persons	Percent of Total Persons	6:15 to 7:15 AM Number of Vehicles	Total Persons	Percent of Total Persons
Drive alone	13	13	1%	2,634	2,634	88%
Carpool: 2-person	310	620	62%	96	192	6%
Carpool: 3+ person	4	12	1%	4	12	<1%
Vanpools	4	44	4%	0	0	0%
Trucks	0	0	0%	140	140	5%
Motorcycles	4	4	<1%	0	0	0%
Buses	14	310	31%	0	0	0%
TOTAL	349	1,003	100%	2,874	2,978	100%

<sup>\*</sup>Note: Rounding may result in a sum of the percentages being less than or greater than 100%.

Average of occupancy counts taken March 20 and 21, 2002.

Bus data obtained from C-TRAN.

Table A-15. July 2002 Post Opening Peak Hour Persons by Mode for Southbound I-5: HOV and GP Lanes

Measured Near 33<sup>rd</sup> Street

		HOV Lane			GP Lanes	
Mode	6:00 to 7:00 AM Number of Vehicles	Total Persons	Percent of Total Persons	6:00 to 7:00 AM Number of Vehicles	Total Persons	Percent of Total Persons
Drive alone	21	21	3%	2,493	2,493	89%
Carpool: 2-person	221	442	54%	67	134	5%
Carpool: 3+ person	4	12	>1%	4	12	<1%
Vanpools	0	0	0%	0	0	0%
Trucks	0	0	0%	175	175	6%
Motorcycles	39	39	5%	0	0	0%
Buses	14	310	38%	0	0	0%
TOTAL	299	824	100%	2,739	2,814	100%

<sup>\*</sup>Note: Rounding may result in a sum of the percentages being less than or greater than 100%.

Average of occupancy counts taken July 9 and 11, 2002.

Bus data obtained from C-TRAN.

### Goal 2 Tables

Travel times are summarized for single-occupancy vehicles and high occupancy vehicles in **Tables A-16** and **A-17**. Since there was no HOV lane in the baseline condition, it is assumed that all of the vehicles on southbound I-5 had the same travel time. Travel time by segment has been averaged over multiple observations made in each reporting period during the 6 to 8 AM period using the moving vehicle method described in the appendix of this report. The travel times were categorized for vehicles traveling on the corridor between the 99<sup>th</sup> Street interchange and the Interstate Bridge. Travel times were measured between off ramps. Note that travel time computations are based on a limited number of observations and are subject to considerable variation. The listed travel times are approximate values, not absolute numbers.

Table A-16. Two-Hour Travel Time Results for HOV and General Purpose Users 99<sup>th</sup> Street to Interstate Bridge (Average, 6-8 AM)

Travel Time in Minutes per Vehicle

		Trav	Travel Time: 99 <sup>th</sup> Street to Interstate Bridge (mid-point)					
		Travel Time <sup>1</sup>	Change Baseline to November	Change Baseline to March	Change November to March	Change Baselin e to July	Change March to July	
Baseline Time – Al		9.9						
Travel Time After HOV	GP <sup>2</sup> Lanes	9.1	-0.8					
Opening – November '01	HOV Lane	7.1	-2.8					
Travel Time After HOV	GP Lanes	10.3		+0.4	+1.2			
Opening – March '02	HOV Lane	6.4		-3.5	-0.7			
Travel Time After HOV	GP Lanes	9.1				+0.8	-1.2	
Opening – July '02	HOV Lane	7.0				-2.9	+0.6	

<sup>&</sup>lt;sup>1</sup> Travel time runs over three different days in September 2001, four different days in November-December 2001, three different days in March 2002, and three different days in July 2002.

<sup>&</sup>lt;sup>2</sup> GP = General Purpose

Table A-17. Peak Hour Travel Time Results for HOV and General Purpose Users 99th Street to Interstate Bridge (Average, 6:15-7:15 AM)1

Travel Time in Minutes per Vehicle

		Tr	avel Time: 99	) <sup>th</sup> Street to I	nterstate Brid	dge (mid-poir	nt)
		Travel Time	Change Baseline to November	Change Baseline to March	Change November to March	Change Baseline to July	Change March to July
	avel Time – Isers	7.9					
Travel Time After HOV	GP <sup>2</sup> Lanes	8.3	+0.4				
Opening – November '01	HOV Lane	7.6	-0.3				
Travel Time After HOV	GP Lanes	7.6		-0.3	-0.7		
Opening – March '02	HOV Lane	6.3		-1.6	-1.3		
Travel Time	GP Lanes	7.7				-0.2	+0.1
After HOV Opening – July '02	HOV Lane	6.4				-1.5	+0.1

Travel time runs over three different days in September 2001, four different days in November-December 2001, three different days in March 2002, and three different days in July 2002.

<sup>&</sup>lt;sup>1</sup> Peak hour was 6:15-7:15 AM for the Baseline, November 2001, and March 2002 reporting periods. The peak hour shifted to 6:00-7:00 AM during the July reporting period. <sup>2</sup> GP = General Purpose

### **Goal 3 Tables**

Tables A-18 and A-19 contain traffic data for I-5, I-205, and other parallel facilities.

Table A-18. Facility Shares of North-South Traffic

Measure	I-5 Share (percent)	I-205 Share (percent)	Others Share* (percent)	Total Vehicles
Two-hour period baseline share (September 2001)	37%	55%	8%	16,998
Two-hour period share, after HOV opening (November 2001)	36%	54%	10%	17,390
Two-hour period share, after HOV opening (March 2002)	37%	56%	7%	17,050
Two-hour period share, after HOV opening (July 2002)	37%	57%	6%	16,056

I-5 and "Others" measured at 99<sup>th</sup> Street. I-205 measured at Mill Plain Boulevard.

Table A-19. Traffic Counts Near 33<sup>rd</sup> Street

Measure	I-5 Count	Main Street Count*	I-5 Share (percent)	Main St. Share (percent)
Two-hour period baseline average count* (September 2001)	6,153	489	93%	7%
Two-hour period average count, after HOV opening (November 2001)	5,779	785	88%	12%
Two-hour period average count, after HOV opening (March 2002)	6,100	835	88%	12%
Two-hour period average count, after HOV opening (July 2002)	5,811	654	90%	10%

Measured near 33<sup>rd</sup> Street (on I-5) and south of 39<sup>th</sup> Street (Main Street).

**Table A-20** provides a detailed summary of I-5 traffic counts near Jantzen Beachfor the 6:00 – 8:00 a.m. period.

Table A-20. Traffic Volumes for all Lanes on Southbound I-5

Measured Near Jantzen Beach

Time Period	Baseline (September 2001)	After HOV Opening (November 2001)	After HOV Opening (March 2002)	After HOV Opening (July 2002)
6:00-7:00 a.m.	4,166	4,113	4,284	3,985
7:00-8:00 a.m.	4,124	4,103	4,313	3,934
Total	8,290	8,216	8,597	7,919

Traffic counts taken in September 2001, November 2001, March 2002, and July 2002.

**Table A-21** povides a detailed summary of southbound I-5 traffic counts for the 5:00 – 9:00 a.m. period.

<sup>\*&</sup>quot;Others" include Highway 99, Hazel Dell Avenue, and Lakeshore Drive.

<sup>\*</sup>Main Street southbound off ramp from I-5 was closed in the Baseline count period.

Table A-21. Traffic Volumes for all Lanes on Southbound I-5 Measured Near 33<sup>rd</sup> Street

Time Period	Baseline (September 2001)	After HOV Opening (November 2001)	After HOV Opening (March 2002)	After HOV Opening (July 2002)
5:00-6:00 a.m.	1,599	1,733	1,615	1,925
6:00-7:00 a.m.	3,036	2,934	3,072	3,039
7:00-8:00 a.m.	3,117	2,845	3,028	2,771
8:00-9:00 a.m.	2,837	3,073	3,071	3,002
Total	10,589	10,585	10,786	10,737

Traffic counts taken in September 2001, November 2001, March 2002, and July 2002.

**Goal 4 Tables** 

**Table A-22** shows the persons in carpools, vanpools, and transit before and after HOV opening. The after HOV opening persons are reported for I-5 users regardless of which lane they are using.

Table A-22. Two-Hour Persons in Carpools, Vanpools, and Transit on I-5

		After HOV Opening (November 2001)		After HOV Opening (March 2002)		After HOV Opening (July 2002)	
Mode	Baseline Persons	All Through Lanes	HOV Lane Only	All Through Lanes	HOV Lane Only	All Through Lanes	HOV Lane Only
Carpools and Vanpools	738	1,905	1,252	1,695	1,294	1,467	1,188
Transit	490	555	555	553	553	579	579
TOTAL	1,228	2,460	1,807	2,248	1,847	2,046	1,767

Baseline is from September 2001.

After HOV Opening is from November 2001, March 2002, and July 2002.

## **Goal 5 Tables**

**Tables A-23** through **A-26** contained detailed incident management information for each reporting period.

Table A-23. Baseline Three-Hour Incident Management Call-Outs

WSP Call-Outs	WSDOT Incident Response Vehicle Call-Outs
On Roadway Incidents	On Roadway Incidents
4 property damage collisions	1 property damage collision
3 blocking disabled vehicles	
2 traffic hazard reports	
Off-Roadway Incidents	Off-Roadway Incidents
2 abandoned non-blocking vehicles	0 Off-Roadway incidents
1 disabled non-blocking vehicle	

September 2001 data (I-5 SB 6 to 9 AM).

Table A-24. November 2001 Post Opening Three-Hour Incident Management Call-Outs

WSP Call-Outs	WSDOT Incident Response Vehicle Call-Outs		
On Roadway Incidents	On Roadway Incidents		
5 property damage collisions	0 property damage collisions		
7 blocking disabled vehicles			
0 traffic hazard reports			
Off-Roadway Incidents	Off-Roadway Incidents		
0 abandoned non-blocking vehicles	0 Off-Roadway incidents		
0 disabled non-blocking vehicles			

October 29 - November 16, 2001 data (I-5 SB 6 to 9 AM)

Table A-25. March 2002 Post Opening Three-Hour Incident Management Call-Outs

WSP Call-Outs	WSDOT Incident Response Vehicle Call-Outs		
On Roadway Incidents	On Roadway Incidents		
2 property damage collisions	1 property damage collision		
3 blocking disabled vehicles	1 blocking disabled vehicle		
0 traffic hazard reports			
Off-Roadway Incidents	Off-Roadway Incidents		
2 abandoned non-blocking vehicles	1 Off-Roadway incident		
4 disabled non-blocking vehicles			

March 11 – March 29, 2002 data (I-5 SB 6 to 9 AM).

Table A-26. July 2002 Post Opening Three-Hour Incident Management Call-Outs

WSP Call-Outs	WSDOT Incident Response Vehicle Call-Outs		
On Roadway Incidents	On Roadway Incidents		
2 property damage collisions	1 property damage collision		
1 blocking disabled vehicles	1 blocking disabled vehicle		
0 traffic hazard reports			
Off-Roadway Incidents	Off-Roadway Incidents		
1 abandoned non-blocking vehicle	2 abandoned non-blocking vehicle		
4 disabled non-blocking vehicles	10 disabled non-blocking vehicles		

July 1 – 19, 2002 data (I-5 SB 6 to 9 AM).

# **Goal 6 Tables**

Tables A-27 through A-30 contain observed violation rate data and enforcement data.

Table A-27. July 2002 HOV Lane Observed Violation Rates
Using Vehicle Occupancy Counts

Mode	Two-Hour Percent of Total Vehicles	Peak Hour Percent of Total Vehicles
Drive alone	6%	7%
Eligible Vehicles	94%	93%
TOTAL	100%	100%
OBSERVED VIOLATION RATE	6%	8%

Calculations shown include spreadsheet rounding. Average of occupancy counts taken July 9 and 11, 2002.

Table A-28. Peak Hour HOV Lane Observed Violation Rates
Using Vehicle Occupancy Counts

Reporting Period	Two Hour Observed Violation Rate	Peak Hour Observed Violation Rate	
November 2001	5%	5%	
March 2002	5%	4%	
July 2002	6%	8%	

Calculations shown include spreadsheet rounding. Average of occupancy counts taken March 20 and 21, 2001, November 13 and 14, 2001, and July 9 and 11, 2002.

Table A-29. Weekly Enforcement Data

Category	November 2001 Weekly Average	March 2002 Weekly Average	July 2002 Weekly Average	Weekly % Change Nov to March	Weekly % Change March to July
HOV citations	7	12	2	71%	-83%
HOV warnings	25	6	3	-76%	-50%
Seat belt violations	4	2	3	-50%	-50%
No insurance	8	1	0	-88%	-100%
Tows	2	0	0	-100%	0%
# Car officers	9	9	5	0%	-44%
# M/C officers	12	6	4	-50%	-33%
# Enforcement hours	11	9	6	-18%	-33%

Table A-30. Daily Enforcement Data

Category	November 2001 Daily Average	March 2002 Daily Average	July 2002 Daily Average	Daily % Change Nov to March	Daily % Change March to July
HOV citations	1	3	0	200%	-100%
HOV warnings	5	1	1	-80%	0%
Seat belt violations	1	1	1	0%	0%
No insurance	2	0	0	-100%	0%
Tows	1	0	0	-100%	0%
# Car officers	1.9	1.9	1.1	0%	-42%
# M/C officers	2.5	1.2	0.9	-52%	-25%
# Enforcement hours	2.3	1.9	1.3	-17%	-32%

### APPENDIX B

## **Travel Time Methodology**

The following is the methodology used for conducting travel time studies of the corridor. These were used to establish baseline conditions and will be used for the evaluation data collection.

- 1. Travel time runs begin at approximately 6 AM and end at approximately 8 AM.
- 2. If there is an incident such as bad weather, construction, maintenance, or an accident that affects traffic, note it and continue the study. Note the weather, date, day of week, and time of the run. It is desirable that this be done at the beginning of each run.
- 3. Try to travel at the median speed. As necessary, pass slow moving vehicles and allow fast moving vehicles to pass, but try to make sure that an equal number of vehicles pass as are passed.
- 4. At each checkpoint, note the time. If the location gets cut off it can be deduced from the previous location by its order. If the time gets cut off and it cannot be figured out, the run will need to be repeated another day.